

**ELECTRICAL CONNECTOR ADAPTED FOR USE WITH DIFFERENT  
ELECTRONIC CARDS**

**BACKGROUND OF THE INVENTION**

**1. Field of the Invention**

5       The invention relates to a connector, more particularly to an electrical connector adapted for use with different electronic cards.

**2. Description of the Related Art**

10       Various types of electronic cards, such as a memory stick (MS) card, a secure digital (SD) card, a multimedia card (MMC), a smart media card (SMC) and an XD card, are currently available for storing electrical data of portable electronic devices, such as a personal digital assistant (PDA), a digital camera (DC), a digital video  
15       camera (DV), an MP3 player, etc.

      Since the above MS, SMC, MMC, SD and XD cards have different sizes and specifications, in view of limited available space, current portable electronic devices are not configured for use with a large number of the  
20       different electronic cards due to the lack of an electrical connector having different card receiving grooves for the above electronic cards.

**SUMMARY OF THE INVENTION**

      Therefore, the object of the present invention is  
25       to provide an electrical connector that is adapted for use with first to fifth electronic cards having different specifications.

According to the present invention, there is provided an electrical connector adapted for use with first to fifth electronic cards. The first to fifth electronic cards are formed with a respective set of conductive contacts and have different specifications. The electrical connector comprises:

a dielectric connector housing confining a card receiving groove and having a front open side, the card receiving space being configured with first to fifth card receiving spaces, each of which is adapted to receive a corresponding one of the first to fifth electronic cards therein; and

conductive terminal means mounted on the dielectric connector housing, extending into the card receiving groove, and adapted to contact electrically the conductive contacts on one of the first to fifth electronic cards when said one of the first to fifth electronic cards is inserted into the corresponding one of the first to fifth card receiving spaces through the front open side of the dielectric connector housing.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

Other features and advantages of the present invention will become apparent in the following detailed description of the preferred embodiment with reference to the accompanying drawings, of which:

Figure 1 is a perspective view showing the preferred embodiment of an electrical connector according to this

invention;

Figure 2 is a schematic sectional view of Figure 1, taken along line II-II;

Figure 3 is a schematic front view showing the preferred embodiment when used with a first electronic card;

Figure 4 is a schematic sectional view of Figure 3, taken along line IV-IV;

Figure 5 is a schematic front view showing the preferred embodiment when used with a second electronic card;

Figure 6 is a schematic sectional view of Figure 5, taken along line VI-VI;

Figure 7 is a schematic front view showing the preferred embodiment when used with a third electronic card;

Figure 8 is a schematic sectional view of Figure 7, taken along line VIII-VIII;

Figure 9 is a schematic front view showing the preferred embodiment when used with a fourth electronic card;

Figure 10 is a schematic sectional view of Figure 9, taken along line X-X;

Figure 11 is a schematic front view showing the preferred embodiment when use with a fifth electronic card; and

Figure 12 is a schematic sectional view of Figure

11, taken along line XII-XII.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to Figures 1 to 3, the preferred embodiment of an electrical connector 100 according to the present invention is shown to be adapted for use with first to fifth electronic cards. As illustrated in Figures 3 to 12, the first to fifth electronic cards are MS, SMC, MMC, SD and XD cards 3, 4, 5, 6, 7, respectively, which are formed with a respective set of conductive contacts (not shown) and which have different specifications. The electrical connector 100 includes a dielectric connector housing 1 and conductive terminal means.

The dielectric connector housing 1 has top and bottom walls 111, 112 opposite to each other in a first direction (A), a rear wall 12 interconnecting the top and bottom walls 111, 112, and left and right lateral walls 113, 113' opposite to each other in a second direction (B), interconnecting the top and bottom walls 111, 112 and cooperating with the rear wall 12 and the top and bottom walls 111, 112 so as to confine a card accommodating groove 14, as best shown in Figure 1. The dielectric connector housing 1 further has a front open side 11 opposite to the rear wall 12 in a third direction (C) for access into the card accommodating groove 14, as best shown in Figure 2.

As best shown in Figures 2 and 3, the top wall 111 has a first inner mounting surface 1111, and a first

outer mounting surface 1112. The bottom wall 112 has a second inner mounting surface 1121, and a second outer mounting surface 1122 opposite to the second inner mounting surface 1121. Each of the left and right lateral walls 113, 113' has an inner surface 1131 (see Figure 3).

The first and second inner mounting surfaces 1111, 1121 of the top and bottom walls 111, 112, the inner surfaces 1131 of the left and right walls 113, 113' and the rear wall 12 configure the card accommodating groove 14 with a first card receiving space 141 adapted to receive the MS card (i.e., the first electronic card) 3 therein, as shown in Figures 3 and 4.

Referring to Figures 3, 5 and 6, the inner surface 1131 of each of the left and right lateral walls 113, 113' is formed with an elongate engaging groove 15, 15' that has a narrowest first portion 151, a widest second portion 152, 152' opposite to the first portion 151 in the second direction (B), in spatial communication with the card accommodating groove 14, and having a width in the first direction (A) less than a distance between the first and second inner mounting surfaces 1111, 1121 of the top and bottom walls 111, 112, and a third portion 153, 153' interconnecting the first portion 151 and the second portion 152, 152', as best shown in Figure 3. The first portion 151 of the engaging groove 15, 15' in the inner surface 1131 of each of the left and right

lateral walls 113, 113' has first top, bottom and lateral limit walls 1511, 1512, 1513. The first top, bottom and lateral limit walls 1511, 1512, 1513 of the engaging grooves 15, 15' in the left and right lateral walls 113, 113' and the rear wall 12 configure the card accommodating groove 14 with a second card receiving space 142 adapted to receive the SMC card (i.e., the second electronic card) 4 therein, as shown in Figures 5 and 6.

The second portion 152, 152' of the engaging groove 15, 15' in each of the left and right lateral walls 113, 113' has a front part 1521, 1521' proximate to the front open side 11 of the dielectric connecting housing 1, and a rear part 1522, 1522' between the front part 1521, 1521' and the rear wall 12 (see Figure 8).

In this embodiment, the front part 1521 of the second portion 152 of the engaging groove 15 in the left lateral wall 113 has a first front top limit wall 15211, as shown in Figure 3. The rear part 1522 of the second portion 152 of the engaging groove 15 in the left lateral wall 113 has a first rear top limit wall 15221 connected to the first front top limit wall 15211, a first rear top shoulder wall 15222 connected to the first rear top limit wall 15221, and a first rear limit wall 15225 connected to the first rear top limit wall 15221 and the first rear top shoulder wall 15222, as shown in Figures 7 and 8. The front part 1521' of the second portion 152' of

the engaging groove 15' in the right lateral wall 113' has a second front top limit wall 15211', a second front bottom limit wall 15213' opposite to the second front top limit wall 15211' in the first direction (A), and  
 5 a second front bottom shoulder wall 15214' connected to the second front bottom limit wall 15213', as shown in Figure 3. The rear part 1522' of the second portion 152' of the engaging groove 15' on the right lateral wall 113' has a second rear top limit wall 15221' connected to the second front top limit wall 15211',  
 10 a second rear top shoulder wall 15222' connected to the second rear top limit wall 15221', a second rear bottom limit wall 15223' connected to the second front bottom limit wall 15213', a second rear bottom shoulder wall 15224' connected to the second rear bottom wall 15223',  
 15 and a second rear limit wall 15225' connected to the second rear top and bottom limit walls 15221', 15223' and the second rear top and bottom shoulder walls 15222', 15224', as shown in Figures 7 and 8.

20 The third portion 153 of the engaging groove 15 in each of the left and right lateral walls 113, 113' has a front part 1531, 1531' proximate to the front open side 11 of the dielectric connector housing 1, and a rear part 1532, 1532' between the front part 1531, 1531' and the rear wall 12 (see Figure 12).

In this embodiment, the front part 1531 of the third portion 153 of the engaging groove 15 in the left lateral

wall 113 has a third front bottom limit wall 15313, and a third front bottom shoulder wall 15314 interconnecting the third front bottom limit wall 15313 and the first bottom limit wall 1512 of the first portion 151 of the engaging groove 15 in the left lateral wall 113, as shown in Figure 11. The rear part 1532 of the third portion 153 of the engaging groove 15 in the left lateral wall 113 has a third rear top limit wall 15321 connected to the first rear top shoulder wall 15222 of the second portion 152 of the engaging groove 15 in the left lateral wall 113, a third rear bottom limit wall 15323 connected to the third front bottom limit wall 15313, and a third rear limit wall 15325 connected to the third rear top and bottom limit walls 15321, 15323, as shown in Figures 3 and 12. The front part 1531' of the third portion 153' of the engaging groove 15' in the right lateral wall 113' has a fourth bottom limit wall 15313', and a fourth front bottom shoulder wall 15314' interconnecting the fourth front bottom limit wall 15313' and the first bottom limit wall 1512 of the first portion 151 of the engaging groove 15' in the right lateral wall 113', as shown in Figure 11. The rear part 1532' of the third portion 153' of the engaging groove 15' in the right lateral wall 113' has a fourth rear top limit wall 15321' connected to the second rear top shoulder wall 15222' of the second portion 152' of the engaging groove 15' in the right lateral wall 113', a



fourth rear bottom limit wall 15323' connected to the fourth front bottom limit wall 15313', and a fourth rear limit wall 15325' connected to the fourth rear top and bottom limit walls 15321', 15323', as shown in Figures 3 and 12.

As such, the first front and rear top limit walls 15211, 15221, the first rear top shoulder wall 15222, the first rear limit wall 15225, the second front and rear top limit walls 15211', 15221', the second rear top shoulder wall 15222', the fourth front and rear bottom limit walls 15313', 15323' and the second rear limit wall 15225' configure the card accommodating groove 14 with a third card receiving space 143 adapted to receive the MMC card (i.e., the third electronic card) 5 therein, as shown in Figures 7 and 8.

Moreover, the first front and rear top limit walls 15211, 15221, the first rear top shoulder wall 15222, the first rear limit wall 15225, the second front and rear top limit walls 15211', 15221', the second rear top shoulder wall 15222', the second front and rear bottom limit walls 15213', 15223', the second front and rear bottom shoulder walls 15214', 15224' and the second rear limit wall 15225' configure the card accommodating groove 14 with a fourth card receiving space 144 adapted to receive the SD card (i.e., the fourth electronic card) 6 therein, as shown in Figures 9 and 10.

The first and second front top limit walls 15211,

15211', the third and fourth bottom limit walls 15313, 15313', the third and fourth front bottom shoulder walls 15314, 15314', and the third and fourth rear limit walls 15325, 15325' configure the card accommodating groove 14 with a fifth card receiving space 145 adapted to receive the XD card (i.e., the fifth electronic card) 7 therein, as shown in Figures 11 and 12.

The conductive terminal means is mounted on the dielectric connector housing 1, extends into the card accommodating groove 14, and is adapted to contact electrically the conductive contacts on one of the first to fifth electronic cards 3, 4, 5, 6, 7 when the latter is inserted into a corresponding one of the first to fifth card receiving spaces 141~145 through the front open side 11 of the dielectric connector housing 1. In this embodiment, the conductive terminal means includes a set of first conductive terminals 31, a set of second conductive terminals 32, a set of third conductive terminals 33, and a set of fourth conductive terminals 34, as shown in Figure 2.

The first conductive terminals 31 are mounted on the rear wall 12. Each first conductive terminal 31 has a first coupling end portion 311 extending outwardly of the rear wall 12 through a corresponding one of a plurality of mounting holes 121 in the rear wall 12, and a first contacting end portion 312 opposite to the first coupling end portion 311, projecting into the first

card receiving space 141, and adapted to contact electrically a corresponding one of the conductive contacts on the MS card 3 when the MS card 3 is inserted into the first card receiving space 141 through the front open side 11 of the dielectric connector housing 1.

The second conductive terminals 32 are mounted on the first inner mounting surface 1111 of the top wall 111. Each second conductive terminal 32 has a second coupling end portion 321 extending outwardly of the rear wall 12 through a corresponding one of the mounting holes 121 in the rear wall 12, and a second contacting end portion 322 opposite to the second coupling end portion 321, projecting into the second card receiving space 142, and adapted to contact electrically a corresponding one of the conductive contacts on the SMC card 4 when the SMC card 4 is inserted into the second card receiving space 142 through the front open side 11 of the dielectric connector housing 1.

The third conductive terminals 33 are mounted on the second outer mounting surface 1122 of the bottom wall 112. Each third conductive terminal 33 has a third coupling end portion 331 extending outwardly of the rear wall 12, and a third contacting end portion 332 opposite to the third coupling end portion 331, projecting into the third and fourth card receiving spaces 143, 144, and adapted to contact electrically a corresponding one of the conductive contacts on one of the MMC and SD cards

5, 6 when said one of the MMC and SD cards 5, 6 is inserted into the corresponding one of the third and fourth card receiving spaces 143, 144 through the front open side 11 of the dielectric connector housing 1. In this embodiment, the bottom wall 112 of the dielectric connector housing 1 is formed with a through hole unit 1124 which permits extension of the third contacting end portions 332 of the third conductive terminals 33 into the third and fourth card receiving spaces 143, 144.

The fourth conductive terminals 34 are mounted on the first outer mounting surface 1112 of the top wall 111. Each fourth conductive terminal 34 has a fourth coupling end portion 341 extending outwardly of the rear wall 12, and a fourth contacting end portion 342 opposite to the fourth coupling end portion 341, projecting into the fifth card receiving space 145, and adapted to contact electrically a corresponding one of the conductive contacts on the XD card 7 when the XD 7 card is inserted into the fifth card receiving space 145 through the front open side 11 of the dielectric connector housing 1. In this embodiment, the top wall 111 of the dielectric connector housing 1 has a front end portion 1113 formed with a through hole unit 1114 which permits extension of the fourth contacting end portions 342 of the fourth conductive terminals 34 into the fifth card receiving space 145 therethrough.

While the present invention has been described in connection with what is considered the most practical and preferred embodiment, it is understood that this invention is not limited to the disclosed embodiment  
5 but is intended to cover various arrangements included within the spirit and scope of the broadest interpretation so as to encompass all such modifications and equivalent arrangements.